

REMARKS

Reconsideration of the present application is respectfully requested in view of the foregoing amendments and the following remarks.

The drawings stand objected to under 37 CFR § 1.83(a) for failing to show every feature of the invention specified in the claims.

Claims 1-14 remain pending. Claims 1-14 stand rejected. Claims 1-3 and 7 stand rejected under 35 U.S.C. §102(e) as being anticipated by Takeuchi et al. (U.S. Patent No. 6,130,446A). Claims 4-5 stand rejected under 35 U.S.C. §103(a) as being unpatentable over Takeuchi et al. in view of Okazaki (U.S. Patent No. 5,990,500A). Claim 6 stands rejected under 35 U.S.C. §103(a) as being unpatentable over Takeuchi et al. in view of Shim et al. (U.S. Patent No. 6,100,103A). Claims 8-12 and 14 stand rejected under 35 U.S.C. §103(a) as being unpatentable over Takeuchi et al. in view of Okazaki. Claims 8 and 13 stand rejected under 35 U.S.C. §103(a) as being unpatentable over Takeuchi et al. in view of Shim et al. No new matter has been introduced.

Regarding the objection to the drawings under 37 CFR § 1.83(a) with respect to claim 8, FIGURE 5 has been included to show the claim features recited in originally filed claim 8. Specifically, FIGURE 5 includes "an p-type GaN-based III-V Group compound semiconductor layer adjacent to said main surface and a n-type GaN-based III-V Group compound semiconductor layer adjacent to said p-type semiconductor layer". Further, support for FIGURE 5 may be found on page 3, lines 19-23 ("in an alternative embodiment of the present invention, the positions of the n-type and p-type semiconductor layers are switched, and the electrode being in contact with the n-type semiconductor layer has good reflectivity of light and covers most outer surface of the n-type

semiconductor layer." Additionally, support may be found on page 7, lines 8-11 ("in other embodiments...and provides current spreading effect").

Generally, the principals of the present invention include a flip-chip light-emitting device that does not require a soldering pad in its main light-emitting surface. Additionally, the light-emitting device includes an electrode that has good reflectivity of light. Therefore, the light directed to the electrode may be reflected by the electrode to the outside through the transparent substrate to increase the light-emitting efficiency of the device. Further, the electrodes may have sufficient size and thickness to provide an effective current spreading effect, such that the light-emitting diode may achieve an increased light-emitting result.

Referring to the rejection of claims 1-3 and 7 under 35 U.S.C. §102(e) as being anticipated by Takeuchi et al, as described in column 7, lines 30-36, "as shown in FIG. 4B, a transparent electrode 4 composed of a laminated film of Ni (2 nm in thickness) and Au (4 nm in thickness) is formed by a method such an electron beam evaporation almost all over the surface of the p-type GaN layer 3 to be a surface where light emission is observed." (emphasis added) Apparently, the emitted light of the light-emitting device disclosed by Takeuchi passes through the transparent electrode 4, instead of the sapphire substrate 1, to the outside. Therefore, the light-emitting device disclosed by Takeuchi is not a flip-chip light-emitting device as claimed by Applicants (claim 1, line 1; "A flip-chip light-emitting device, comprising"). In addition, since the electrode 4 is transparent, it is not possible for the electrode 4 to have reflectivity of light properties as claimed by Applicants (claim 1, line 12, "said second electrode has good reflectivity of light"). Furthermore, since the electrode 4 of Takeuchi must be very thin to become transparent, the lateral resistance of the electrode 4 is

greater than the vertical resistance, and thus, the electrode 4 cannot provide an effective current spreading effect.

Additionally, as illustrated in FIG. 4E of Takeuchi, the pad electrode 7 on the upper surface of the transparent electrode blocks the light, and thus the light-emitting area is reduced. In addition, since the electrode for Takeuchi is placed over the main light-emitted surface, even being transparent, the light-emitting efficiency of the device is reduced.

In view of the above, Takeuchi neither discloses nor teaches a "flip-chip light-emitting device" (claim 1, line 1) with an electrode that "has good reflectivity of light" (claim 1, line 12). Therefore, Applicants respectfully request that the §102 rejection of claim 1 be withdrawn.

Claims 2-3 and 7 depend from independent claim 1 and should be allowable for at least the same reasons. Applicants respectfully request that the §102(e) rejection be withdrawn for claims 2-3 and 7.

Regarding the rejection of claims 4-5 under 35 U.S.C. §103(a) as being unpatentable over Takeuchi in view of Okazaki. As stated in the Office Action on page 4, "Okazaki teaches a base which has a first and a second conductive portions respectively connected to the first and second electrodes; and the base can be a conductive lead frame (Figure 7, col. 1, lines 37-48)". However, similar to Takeuchi, Okazaki fails to disclose Applicants' claimed features of independent claim 1 (e.g., having "good reflectivity of light"). Therefore, the combination of Takeuchi and Okazaki does not disclose, teach, or suggest Applicants' claimed invention. Applicants respectfully request that the rejection of claims 4-5 under §103(a) be withdrawn.

With respect to the rejection of claim 6 under 35 U.S.C. §103(a) as being unpatentable over Takeuchi et al., in view of Chien et al., Chien describes a process performing metal contact layers 31 and 33 for ohmic contacts, wherein after the first step, "the contact resistances of the metal contact layers 31 and 33 are lower than 1×10^{-3} ohms/cm² (col. 6, lines 39-40; lines 31-45). Apparently, the metal contact layers 31 and 33 must be thick enough to have a lower resistance, and thus unlikely to be light-transmitting layers. Therefore, Chien does not disclose, teach, or suggest an electrode having "a multi-layer structure comprising a light-transmitting conductive layer and a layer of aluminum (Al) or silver (Ag)", as claimed in claim 6. Accordingly, Applicants respectfully request that the rejection of claim 6 under 103(a) be withdrawn.

Regarding claims 8-14, the rejections of these claims under 35 U.S.C. §103(a) are deficient in a similar manner as described with regard to claims 1-7. Therefore, claims 8-14 should be allowable for at least the same reasons as those presented for claims 1-7. Accordingly, Applicants respectfully request that the rejections of claims 8-14 under 35 U.S.C. §103(a) be withdrawn.

In view of the foregoing, Applicants submit that no further impediments exist to the allowance of this application and therefore solicit an early notice of allowance.

Respectfully submitted,

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A handwritten signature in cursive script, appearing to read "Gary B. Solomon", written in black ink.

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